Meridian 1

Intelligent Peripheral Equipment Circuit Cards for France

Option 11 - Description and Installation

Document Number: 553-3011-210
Document Release: Provisional 1.0
Date: November 1993

© 1993
All rights reserved

Printed in Canada

Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules.

SL-1 and Meridian 1 are trademarks of Northern Telecom.

Revision history

November 1993

Provisional, release 1.0

September 1993

Preliminary, release 1.1

August 1993

Preliminary, release 1.0

March 1993

Draft, release 1.0

Contents

About this document ..... **vii**

E&M tie trunk circuit card **1**

Functional description 1

Physical description 2

Technical description 11

Trunk types description 12

Flexible analog line circuit card **19**

Functional description 19

Physical description 20

Technical description 20

About this document

This document is a Supplement to the Option 11 *Installation guide (553-3011-210). It describes the functions and applications of the following circuit cards that are available for use in France:*

- NT5K50AA E&M Tie Trunk card
- NT5K02DA Flexible Analog line card

E&M tie trunk circuit card

Functional description

The NT5K50AA E&M Tie trunk card provides the interface between the Option 11 system and up to four analog trunks. It can be installed in slots 1-10 in the Option 11 main cabinet and in any slot in the expansion cabinet.

The NT5K50AA E&M Tie trunk card supports four analog trunks. Each trunk circuit can be individually configured as:

- 4-wire E&M BPO (Type V)
- 4-wire E&M , Type II
- Recorded Announcement (RAN) trunk
- Paging (PAG) trunk
- Music (Mus) trunk

Common features

The NT5K50AA E&M Tie trunk card:

- has four switch settings (one per unit) used to select Type V E&M signaling.

Note: Systems using Phase 8B or later software can select BPO signaling in overlay 14.

- supports "wink", "immediate start", or "delay dial" signaling
- converts transmission signals from analog-to-digital and from digital-to-analog
- provides software selectable A-law or μ-law operation
- enables and disables individual units or the entire card under software control
- provides indication of card status on the faceplate LED
- allows trunk type to be configured on a per unit basis in software
- provides termination against 600 ohms for 4-wire trunk circuits
- provides flexible transmission for various loss plans
- provides paging (PAG), recorded announcement (RAN), and music (MUS) interfaces.

Physical description

Switch settings

There are four switch settings on the NT5K50AA circuit card, one for each trunk unit. The switches are used to select Type V E&M signaling. (Type II E&M is selected in software).

Note: In order for Type V signaling to work, the TYP prompt in LD 14 must be set to TY1 or to BPO if available.

Table 1
NT5K50AA E&M Trunk card switch settings

Signaling	Switch Setting (J1.x) Pins 1-2	Pins 2-3
4-wire Type II RAN MUS PAG	Closed	Open
4-wire Type V (BPO)	Open	Closed

Connections

Each unit on the E&M card connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Hardware installation

Tables 2 to 5 provide cross connect information for the NT5K50AA E&M Trunk card

Table 2
NT5K50AA E&M 2-Wire Paging trunk connections

Lead designations	Pins	Pair color	Unit number
T0 R0	27 2	W-O O-W	Unit 0
A PG	29 4	W-BR BR-W	
T1 R1	31 6	R-BL BL-R	Unit 1
A PG	33 8	R-G G-R	
T2 R2	35 10	R-S S-R	Unit 2
A PG	37 12	BK-O O-BK	
T3 R3	39 14	BK-BR BR-BK	Unit 3
A PG	41 16	Y-BL BL-Y	

Table 3
NT5K50AA E&M 2-wire Recorded Announcement trunk connections

Lead designations	Pins	Pair color	Unit number
T0 R0	26 1	W-BL BL-W	Unit 0
SIG B SIG A	29 4	W-BR BR-W	
T1 R1	30 5	W-S S-W	Unit 1
SIG B SIG A	33 8	R-G G-R	
T2 R2	34 9	R-BR BR-R	Unit 2
SIG B SIG A	37 12	BK-O O-BK	
T3 R3	38 13	BK-G G-BK	Unit 3
SIG B SIG A	41 16	Y-BL BL-Y	

Table 4
NT5K50AA E&M 4 Wire (Transmission) Type II (Signalling) connections

Lead designations	Pins	Pair color	Unit number
RA RB	26 1	W-BL BL-W	
TA TB	27 2	W-O O-W	Unit 0
E M	28 3	W-G G-W	
SIG0A SIG0B	29 4	BR-W W-BR	
RA RB	30 5	W-S S-W	
TA TB	31 6	R-BL BL-R	Unit 1
E M	32 7	R-O O-R	
SIG1A SIG1B	33 8	R-G G-R	
RA RB	34 9	R-BR BR-R	
TA TB	35 10	R-S S-R	Unit 2
E M	36 11	BK-BL BL-BK	
SIG2A SIG2B	37 12	BK-O O-BK	
RA RB	38 13	BK-G G-BK	
TA TB	39 14	BK-BR BR-BK	Unit 3

Lead designations	Pins	Pair color	Unit number
E M	40 15	BK-S S-BK	
SIG3A SIG3B	41 16	Y-BL BL-Y	

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 5
NT5K50AA E&M 4 Wire (Transmission) Type V (Signalling) connections

Lead designations	Pins	Pair color	Unit number
RA RB	26 1	W-BL BL-W	Unit 0
TA TB	27 2	W-O O-W	
E M	28 3	W-G G-W	
RA RB	30 5	W-S S-W	Unit 1
TA TB	31 6	R-BL BL-R	
E M	32 7	R-O O-R	
RA RB	34 9	R-BR BR-R	Unit 2
TA TB	35 10	R-S S-R	
E M	36 11	BK-BL BL-BK	
RA RB	38 13	BK-G G-BK	Unit 3
TA TB	39 14	BK-BR BR-BK	
E M	40 15	BK-S S-BK	

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Self-test

When the NT5K50AA E&M Tie trunk card is installed and power is applied to it, a self-test is performed on the card. The red LED on the NT5K50AA faceplate flashes three times, then remains continuously lit until the card is enabled in software. If the self-test fails, the LED will remain lit after the card is enabled.

Trunk configuration

Route Data Block

Each trunk unit on the NT5K50AA E&M trunk card is attached to a route with an associated route data block. The route data block is programmed in overlay 16.

Note: All prompts are defaulted except for those noted in Table 6. Default values are shown in brackets.

Table 6
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	
TYPE	RDB	Define a new Route Data Block
CUST	0-99	Enter customer number
ROUT	0-511	Enter route number
TKTP	TIE, RAN, PAG	Define trunk type as Tie, Recorded announcement or Paging
ICOG	IAO	Incoming and Outgoing trunk
ACOD	XX	XX=Trunk route access code

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NT5K50AA E&M trunk card. Default values are shown in brackets.

Table 7
LD 14 Route Data Block

Prompt	Response	Comments
REQ	NEW	Define a new trunk unit
TYPE	TIE, RAN, PAG	Trunk type Tie, (Recorded announcement), (Voice paging)
TN	CC UU	Terminal number of the unit: Card, Unit
XTRK (see note)	XFEM	Type is IPE XFEM
SIGL	EM4, EAM,	4 wire E&M, 2-wire E&M,

Prompt	Response	Comments
EMTY	TY1, (TY2)	Type 1signaling, (Type 2)
		Also use TY1 for Type V or BPO
STRI	IMM, WNK, DDL	Incoming start Immediate, Wink, Delayed dial
STRO	IMM, WNK, DDL	Outgoing start immediate, Wink, Delayed Dial
SUPN	YES, (NO)	Answer and disconnect supervision
CLS	DTN, (DIP)	Digitone, (Dialpulse)

Note: This prompt is required only for the first unit defined on each NT5K50AA card.

Technical description

Power requirements

Table 8 lists the power requirements for the NT5K50AA trunk card.

Table 8
NT5K50AA Power requirements

Voltage	Active Current
+/- 15.0 V dc	150 ma
+8.5 V dc	35 ma
+ 5 V dc	110 ma
-48 V dc	80 ma

Environmental specifications

Table 9 provides the environmental specifications for the NT5K50AA E&M Tie trunk card.

Table 9
NT5K50AA Environmental specifications

Parameter	Absolute Limit
Operating temperature	10-45 degrees C, ambient
Operating humidity	20 to 80% RH (non condensing)
Storage temperature	-20 to +60 degrees C

Transmission parameters

Loss values for all modes of operation on the E&M trunk card are as follows:

Mode	Pads	A/D Loss (dB)	D/A Loss (dB)
4 wire Mode	Pad out	-3.5	3.5
RAN		0.0	N/A
PAGING		N/A	7.0

Trunk types description

Each unit on the NT5K50AA E&M Tie trunk card supports:

- 4 wire E&M Type V (BPO)
- 4 wire E&M Type II
- Recorded Announcement (RAN) trunk
- Paging (PAG) trunk

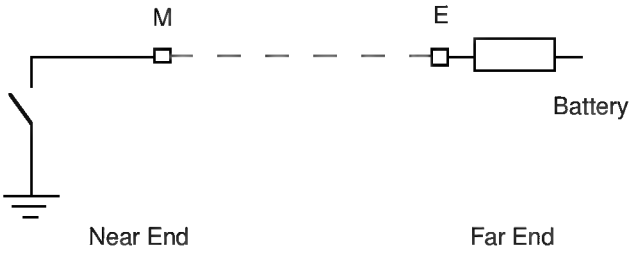
E&M trunk operation

The NT5K50AA E&M tie trunk supports Type II, and Type V methods of signaling.

Type V (BPO) E&M send and receive signals

Type V (BPO)E&M signaling use two signaling leads, E and M, that are electrically separated from the associated speech circuit. Signals are sent on the M lead and received on the E lead as shown in Figure 1. Earth is used for the signal return path.

Figure 1
Type V (BPO) signaling



Send signals

In Type V (BPO) mode, all signals are sent as either "Earth on" or "Earth off" applied to the M wire. Earth off consists of open circuit applied to the M wire, Earth on is the application of ground to the M wire.

Receive signals

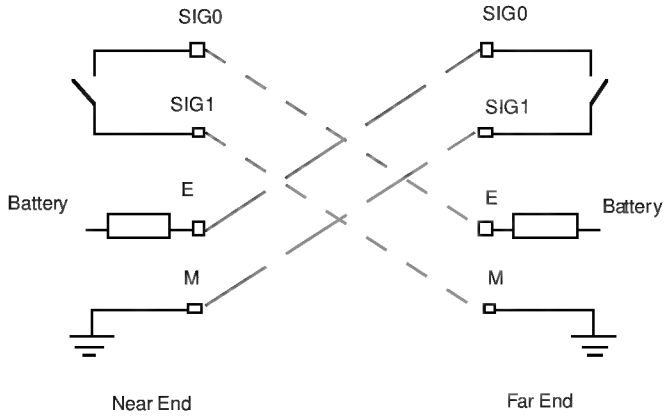
All signals are received as either "Earth on" or "Earth off" applied to the E wire, where:

- Earth on is the application of ground to the E wire through a resistance of up to 1500 ohms
- Earth off is the application of ground to the E wire through a resistance of up to 20 Kohms.

Type II E&M send and receive signals

Type II E&M operation uses two signaling pairs, E and M, that are electrically separated from the associated speech circuit. Signals are sent on the M pair and received on the E pair as shown in Figure 2.

Figure 2
E&M Type II signaling



Send signals

All signals are sent as either an "Open" or "Closed" condition applied to the M wire pair.

Receive signals
All signals are received as either an "Open" or "Closed" condition applied to the E wire, where:

- The Closed condition is a resistance of up to 2 Kohms applied to the E wire pair
- The Open condition is a resistance of greater than 20 Kohms applied to the E wire pair.

Type II and Type V signalling

Tables 10 and 11 provide a summary of signaling states for Type I, Type II, and Type V signaling respectively.

Idle state
In the Idle state, the Option 11 applies an idle signal to the M wire to indicate that it is free to accept incoming calls.

Seize
To place an outgoing call, the Option 11 at the near end sends a seizing signal through the M lead to the far end. The incoming end recognizes the seize signal and prepares to receive digits.

Holding
The continued receipt of the seize signal is seen by the incoming end as a hold signal.

Dialing
The Option 11 sends digits through the M lead in the form of 10 pps of the open-circuit condition.

Answer
When the called party answers, the far end sends an "answer" signal through the M lead.

Call disconnect
Either party can disconnect the call by applying a clear signal to the M lead. The far end applies a "clear back" signal, while the near end applies a "clear forward" signal. The circuit remains busy until both clear forward and clear backward signals have been exchanged.

Table 10
Summary of NT5K50AA Type II signaling states

Signal	Outgoing PBX sending condition—M wire	Incoming PBX sending condition—M wire
Idle	Open	Open
Seize	Closed	—
Hold	Continuation of seizing signal	—
Digit Pulse	Open pulses in step with dial pulses	—
Answer	—	Closed
Clear forward	Open for longer than 300 milliseconds	—
Clear back	—	Open for longer than 300 milliseconds

Table 11
Summary of NT5K50AA Type V signaling states

Signal	Outgoing PBX sending condition—M wire	Incoming PBX sending condition—M wire
Idle	Earth off	Earth off
Seize	Earth on	—
Hold	Continuation of seizing signal	—
Digit Pulse	Earth off pulses in step with dial pulses	—
Answer	—	Earth on
Clear forward	Earth off for longer than 300 milliseconds	—
Clear back	—	Earth off for longer than 300 milliseconds

Recorded Announcement trunk operation

When used in the Recorded Announcement mode, the trunk circuit is connected to a customer provided recorded announcement machine or a music source.

The NT5K50AA E&M Tie trunk card supports the following types of announcement machines:

- Start mode announcement machines
- Continuous mode announcement machines

Recorded announcement machines supported include the Cook Digital 4-channel announcer and the Audichron HQI-112.

The PICSYS 4 RAN machine from ACSYS is the approved RAN for France. It is a 4 channel Digital announcer which can operate in either continuous or Start/Stop mode.

Start mode

In start mode, the E&M Tie trunk card provides a startpulse to the announcement machine to begin playback of the message. The announcement source requires the following:

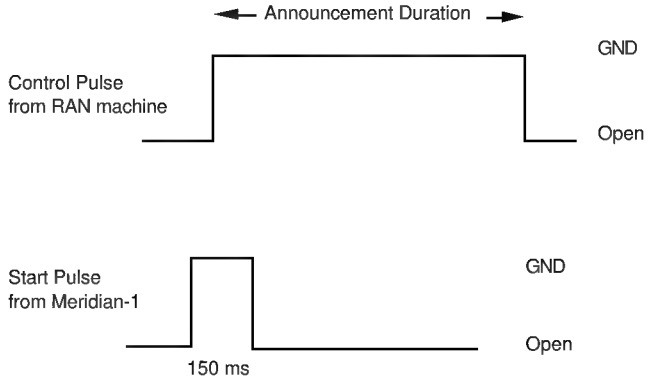
- an impedance of 4 ohms or less
- ground to the trunk unit when playing and an open circuit when idle. This is done through a control lead to the trunk circuit.
- default signal level of -9 dBm (in 600Ω) adjustable to a level of 10 dBm.

To start the announcement, the NT5K50AA E&M Tie trunk card provides a momentary ground signal (150 ms) to the source. The announcement machine should then start playing its message.

The NT5K50AA trunk card expects status information from the announcement machine, that is, whether it is idle or playing. For this reason, the announcement machine requires a control lead to the trunk circuit.

Figure 3shows recorded announcement in start mode.

Figure 3
Recorded announcement - start mode



Continuous mode

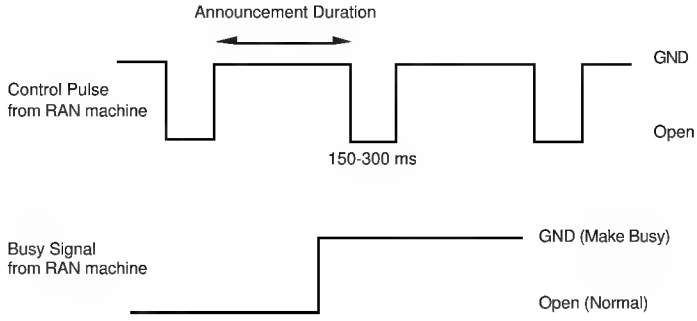
The requirements for continuous mode announcement machines are as follows:

- an impedance of 4 ohms or less
- generation of a control pulse (150 - 300 ms) at the start of the announcement period
- default signal level of -9 dBm (in 600Ω) adjustable to a level of 10 dBm.

The announcement machine may provide a separate busy signal when the machine is recording or erasing a message or if the machine is malfunctioning. The busy signal will be used by the Option 11 for maintenance purposes.

Figure 4 shows recorded announcement in continuous mode.

Figure 4
Recorded announcement - continuous mode



Music source

The music source should provide an impedance of 600 Ω. The default signaling level should be -9 dBm (in 600Ω) adjustable to a level of 10 dBm.

Paging trunk operation

When used in the paging mode, the trunk circuit is connected to a customer-provided paging amplifier system. When accessed, the card provides a loop closure. In a typical application, the loop closure will cut off a music supply and switch the paging trunk transmission path to the paging amplifier.

Flexible analog line circuit card

Functional description

The Flexible analog line card provides an interface for up to 16 analog (500/2500-type) telephones lines. It can be installed in slots 1-10 in the Option 11 main cabinet and in any slot in the expansion cabinet.

The Flexible Analog Line card available for use in France is:

- the NT5K02DA line card with message waiting

Common features

The Flexible Analog line card provides the following features:

- support of digipulse or digitone telephones
- telephone on-hook and off-hook detection based on loop current
- ground button detection
- relay for connecting an ac ringing signal
- collection of dial pulses (10 and 20 pps) from 500-type telephones
- analog to digital and digital to analog conversion for 16 analog telephone lines
- terminating impedance of French Complex impedance
- software selectable A-Law or μ-Law companding
- provision of line current to telephones. Line current is limited on short loops or under fault conditions. Otherwise, current varies according to loop length to allow automatic gain compensation.

Physical description

Switch settings

There are no option switches on the Flexible Analog line card. All settings are configured in software.

Connections

The Flexible Analog line card has 16 units. Each unit connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Faceplate LED

The faceplate of the NT5K02DA is equipped with a red LED which lights when all the assigned units on the circuit card are disabled.

Technical description

Power requirements

Table 1 lists the power requirements for Flexible Analog line card.

Table 12
NT5K02DA power requirements

Voltage	Idle current	Maximum current (all units active)
+15.0 V dc	120 ma	120 ma
-15.0 V dc	48 ma	48 ma
+ 8.5 V dc	250 ma	280 ma
-48.0 V	0 ma	320 ma
- 48.0 V dc	60 ma	700 ma
Ring V ac	0 ma	160 ma (See note)

Note: This figure reflects 10 ma for ringing one telephone per unit. There may be more than one telephone or ringer on a unit.

Environmental specifications

Table 2 lists the environmental specifications of the Flexible Analog line card.

Table 13
NT5K02DA environmental specifications

Parameter	Specifications
Operating temperature	0 to 45 degrees C, ambient
Operating humidity	10 to 95 % Relative Humidity
Storage temperature	- 40 to + 70 degrees C

Signalling

Loop operation

The Flexible Analog Line Card is loop start, with a loop limit of approx 1000 Ω at -48 V excluding the telephone set. The maximum value of current feed is 40 ma .

Table 3 lists the number of telephone sets that can be supported by the loop.

Table 14
Loop limits

Loop resistance including telephone sets	Number of telephone sets
350 Ω or less	2
Over 350 Ω to a maximum of 1300 Ω	1

Ringers

A maximum of 5 NE-C4A ringers can be supported on one unit. Ringing is supplied to the telephones at a frequency of 50 Hz . The maximum rms voltage must not exceed 80V in no load operation.

Message waiting indicator

The message waiting indicator consists of a lamp flashing at a rate of 1 Hz at the telephone set. (A continuously lit lamp as a message indicator is not provided). The lamp is activated as a result of a reversal of the Tip and Ring leads.

Digipulse dialing

The Flexible Analog line card collects all digits of 9-11 pps.

Ground button detection

The ground button detector sends a recall signal 30 to 50 ms after the application of ground through a resistance R to either the Tip or Ring of a telset connected in a balanced loop of up to 1000 Ohms. The loop resistance (R) to the ground signal can be between 0 and 500 Ω.

The ground must be applied for a time greater than the minimum hookflash time. This time is downloaded from software and is known as the ground button validation time.

Transmission parameters

Loss values for the NT5K02DA and NT5K96NB Flexible Analog Line cards are as follows:

Analog to Digital loss: 0.0 dB +/- 0.5 dB

Digital to Analog loss:+7.0 dB +/- 0.5 dB

Meridian 1

Intelligent Peripheral Equipment Circuit Cards for France

Option 11 - Description and Installation

© 1993 Northern Telecom
All rights reserved
Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules.
SL-1 and Meridian 1 are trademarks of Northern Telecom.
Publication number: 553-3011-210
Document release: Provisional 1.0
Date: November 1993
Printed in Canada